Anthracnose Threatens the Flowering Dogwood

Craig R. Hibben

Methods for diagnosing and controlling this new disease.

Something unusual began happening to the flowering dogwood during the late 1970s. *Cornus florida*, one of eighteen species of *Cornus* native to the United States, and probably the most widely grown as an ornamental plant, began to decline over parts of the Northeast. The common stresses on dogwood—borers, soil-borne diseases, drought, and winter kill—did not appear to be major causal factors. From an investigation of declining dogwoods in arboretum and woodland sites in southeastern New York, the cause was identified as a new fungus disease, dogwood anthracnose (Hibben and Daughtrey, 1988). The nature and control of this threat to the flowering dogwood are of interest to all those who grow and appreciate this plant.

Disease Symptoms

Dogwood anthracnose is easily recognizable. The most characteristic symptom is branch death beginning in the lower part of the canopy. Additional symptoms that can help the homeowner differentiate anthracnose from other diseases of dogwood are purple-rimmed brown spots and larger brown blotches on the leaves. The blotches sometimes expand until the entire leaf blade becomes blighted. Blighted leaves often remain hanging on the branches, even over the winter period.

Infection spreads through the petioles of infected leaves into the stems. Infection can also appear on the current year’s branches as tiny sunken lesions that form in the bark. The tips of infected branches die, and a reddish-purple zone often forms between the living and dead bark. Infection progresses downward until entire branches die.

Figure 1. Natural range of *Cornus florida* in eastern U.S. (hatching) and approximate range of dogwood anthracnose (black) in 1989. Disease reports compiled by W. Jackson and R. Anderson, U.S.D.A. Forest Service.
Dogwoods with dieback often produce clusters of epicormic branches (watersprouts) along the trunk and larger branches. When the epicormic branches become diseased and die back, infection moves into the adjoining trunk or branch causing cankers, which are detectable by sunken, swollen, or cracked areas in the bark. Cutting beneath the outer bark reveals patches of dead brown tissue in the inner bark and outer sapwood. The cumulative effect of the cankers is to girdle the stems, which leads to additional branch mortality.

Anthracnose affects dogwoods of all ages and sizes. The disease moves slower in trees located in sun-exposed sites. In fact, infected dogwoods that have received proper cultural care sometimes fully recover. Infected under-story dogwoods in wooded sites, where moisture and shade conditions favor the disease, often die within five years. In some northeastern forest sites, once heavily populated with flowering dogwood, few live dogwoods, including seedlings, remain today.

**Wind-Dispersed Spores**

When leaves and branches from infected dogwoods are examined with a hand lens, numerous reddish-brown to black bumps can be observed on dead tissue. These are fungus fruiting bodies that, when moistened, exude single-celled spores in gelatinous masses or threads. It is these tiny spores, wind spread during rainy periods, that initiate infection on the new leaves of dogwood in the spring.

As more leaves and branches die, new spores are produced. The incredible abundance of spores that form on dead leaf and stem tissues assures that infection can recur throughout the growing season whenever moisture conditions are optimum. Even the hanging blighted leaves play an important role in the disease cycle, as dripping rainwater easily transports spores to the leaves below.

From the structure and dimensions of the fruiting bodies and spores, the fungus was identified as belonging to the genus *Discula*. The *Discula* fungus has also been isolated repeatedly from leaves and stems of diseased dogwoods. Successful inoculations of healthy dogwoods with pure cultures of *Discula* provided the conclusive evidence that this fungus is the cause of the anthracnose disease of *C. florida*.

One theory suggests that recent periods of drought and unusually severe winters have weakened dogwoods, making it more susceptible to attack by *Discula*. The anthracnose fungi, including those attacking oak, maple, and sycamore, are strong pathogens, and they...
do not require a weakened host to cause disease. To reverse the scenario, it is more likely that the infection by *Discula* has predisposed dogwoods to the detrimental effects of recent climatic events. For example, infected dogwoods in our woodland study plot showed far greater winter kill than uninfected dogwoods in the same site. Infected dogwoods are also more likely to be invaded by *Armillaria* [shoestring] root rot, a soil-borne disease that commonly attacks stressed trees.

**Control Recommendations**

Based on what we have learned about the biology of this disease, and from fungicide trials on dogwoods [Daughtrey et al., 1988], we can recommend a three-part program for the control of dogwood anthracnose.

1. Good cultural practices applied to landscape dogwoods can reduce the incidence and effects of disease. Dead branches of infected trees should be pruned out promptly to reduce the sources of spores for new infections. Epicormic branches should be clipped off to prevent their infection and the subsequent formation of branch and trunk cankers. For dogwoods in wooded sites, the only practical control measure is to thin out and open up the sites to provide more sunlight and better air circulation.

Since dogwoods are especially vulnerable to periods of drought because of their shallow root systems, supplemental watering during extended rainless periods is beneficial. Overhead sprinklers should be avoided because wet foliage is more likely to become infected. The application of a balanced fertilizer late in the fall or in early spring will improve tree vigor. Watering and fertilizing dogwoods will not necessarily increase their resistance to anthracnose, but the trees will be better able to recover from the detrimental effects of infection.

2. Fungicides will provide protection against infection. The fungicides Daconil 2787® [chlorothalonil] or Manzate 200® [mancozeb], sprayed three times at approximately ten-day intervals during leaf expansion in the spring, will provide good protection for dogwood foliage. If these fungicides cannot be obtained, Benlate® [benomyl] can be substituted. It is important to apply the fungicide during the spring when dogwoods are most susceptible to infection. Infection of new leaves can also occur during wet periods throughout the growing season. Consequently, for valuable landscape dogwoods, additional sprayings at two-week intervals during the summer will provide added protection.

3. Genetic resistance to anthracnose has not yet been discovered in the flowering dogwood. The commonly grown cultivars of *C. florida* have all shown high susceptibility to the disease. Even dogwoods grown from seed collected outside the known range of the disease have proven susceptible [Santamour and McArdle, 1989]. Research is under way to identify possible disease resistance in surviving dogwoods growing in woodland sites where anthracnose has been especially severe.

4. The kousa or Korean dogwood (*C. kousa*) is hardier, more pest-free, and later flowering than *C. florida*, and is a worthy replacement for it in the landscape. Under most conditions in the East, *C. kousa* has shown good resistance, although not immunity, to anthracnose. There are reports [Holmes and Hibben, 1989] that when the foliage is subjected to long periods of wetness, kousa dogwoods can suffer damage from this disease.
Fortunately, *C. florida* and *C. kousa* are sexually compatible. From a long-term breeding program at Rutgers University (Orton, 1985), several dogwood hybrids are soon to be introduced with improved vigor and pest resistance—including, everyone hopes, resistance to anthracnose.

**Origin of the Epidemic**

Attempts to explain the origin and timing of dogwood anthracnose raise some interesting questions about this disease. In the mid-1970s, a similar outbreak of anthracnose occurred in the native western flowering dogwood (*C. nuttallii*) in the Pacific Northwest. *Discula* was identified as the cause (Salogga and Ammirati, 1983). After comparing fungal isolates from infected *C. florida* and *C. nuttallii*, we concluded that identical or related strains of *Discula* were attacking both dogwoods. This new disease appeared to be attacking related hosts at the same time in both geographic regions.

The periodic wet, cool springs of the Northeast and the yearly rainy season encountered in the maritime Northwest are conditions conducive to anthracnose fungi. But the reason for the sudden epidemic of the disease over part of the northeastern range of *C. florida* and for its coincidental outbreak in *C. nuttallii* is unknown. There are several hypotheses. The outbreak of the disease near ports of entry on both coasts of the U.S. raises the possibility of this particular *Discula* species being a recent import on some other host plant. Alternatively, perhaps the disease has been endemic but at levels too low to be noticed. A shift in rainfall and temperature patterns, or a mutation in the fungus resulting in a new, highly virulent strain, could account for the recent emergence of the disease. There is also some evidence that acid rain makes dogwood foliage more susceptible to invasion by *Discula* (Anderson et al., 1989).
But more research is needed before the role of acid rain in dogwood anthracnose is fully understood.

Dogwood anthracnose has now established itself in natural and ornamental populations of flowering dogwood in parts of the Northeast for over a decade. Surveys indicate that the disease has spread gradually southward and westward since the early 1980s. We anticipate that Discula sp. will continue to have a significant impact on dogwood—with disease severity varying considerably from year to year, depending on weather conditions during the growing season. In the meantime, research is continuing with emphasis on the epidemiology and control of dogwood anthracnose.

References


Dr. Craig R. Hibben is Research Plant Pathologist at the Brooklyn Botanic Garden Research Center in Ossining, New York.